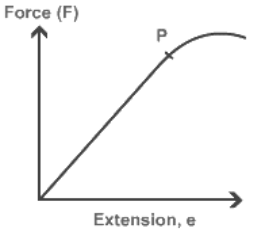
P5- Forces – Part 1

No.	Question	Answer
1	What is a vector quantity?	A quantity with size and direction
2	Give two examples of vectors	Any force and velocity
3	What is a scalar quantity?	A quantity with size only
4	Give two examples of scalar quantities	Temperature and time
5	How are vectors represented in a diagram?	With an arrow, length represent the size of the quantity and the arrowhead the direction
6	What is a force?	A push or pull acting on an object
7	What must be true about a contact force?	The two objects have to be touching for the force to act
8	Give two examples of contact forces	Friction, tension in a spring
9	What type of force is gravity?	A non-contact force?
10	Give two other examples of forces that act in the same way as gravity	Magnetic force, electrostatic force
11	What happens when two objects interact?	A force is produced on both objects
12	What is an interaction pair?	Forces that are equal in size and opposite in direction
13	Which of Newton's Laws of motion is defined by an interaction pair?	Third
14	What is a gravitational force?	An attraction force that acts between masses
15	When do we notice a gravitational force?	When one of the masses is very, very big, like a planet or star.
16	What is mass?	The amount of material an object is made from?
17	What is the standard unit of mass and its unit symbol	Kilograms, kg
18	What is weight?	A force caused by the action of gravity on a mass?
19	What is the unit for weight and all other forces and the unit symbol	Newton, N
20	In what direction does weight always act?	Towards the surface of the planet or star (downwards in most force diagrams)
21	What does the weight of an object depend on?	The strength of the gravitational field and the mass of an object.
22	What is meant by the term "centre of mass"?	An assumption that identifies a single point on object where the whole mass is concentrated
23	State the word equation that links gravitational field strength, mass and weight	Weight = mass X gravitational field strength
24	Give the symbol equation used to calculate weight	W= m X g
25	What is a free body diagram?	A diagram that shows all of the forces acting on an object
26	How are forces represented on a free body diagram	With an arrow, the length represents the size of the force and the arrowhead the direction of the force. (arrows always point away from the object)

27	What is a resultant force?	The overall force acting on an object
28	How do you calculate the resultant force on an object?	Add together forces that are acting in the same direction and subtract any going in the opposite direction. (you may only do this with forces acting along the same line)
29	What happens when a resultant force moves an object?	Energy is transferred between energy stores and work is done
30	What is the word equation that links distance moved, energy transferred and forces?	Work Done = Force X distance moved
31	What is the symbol equation for work done?	W = F x s
32	Name the two units which can be used for measuring work done and the link between them	Joules or Newton metres 1J = 1Nm i.e 1J of energy is used when a force of 1N moves an object a distance of 1m
33	How do you use a scale diagram to find a resultant force?	1. Chose a scale to represent a force e.g. 1cm = 1N 2. Draw your vertical or north pointing force first 3. Draw your horizontal force from the tip of your first arrow (pointing left for east or right for west) 4. Then add your resultant force arrow from the base to the first arrow to the tip of the second arrow 5. Measure the length of the arrow and use your scale to convert it to Newtons 6. Use a protractor to measure the bearing
34	How do you measure a bearing?	You measure clockwise from north and give it a three digit number. (the first number will be zero for any bearing smaller than 100^{o})
35	What does “resolving” a force mean?	Splitting a force into its horizontal and vertical components.
36	How can you resolve a force?	1. Use a scale which converts force to centimetres 2. Draw the resultant force on the correct bearing 3. Create a right angled triangle using the resultant force as the hypotenuse 4. Measure the length of the horizontal and vertical sides and convert to Newtons using your scale
37	What is true of the forces on an object that is in equilibrium?	Forces are balanced or there is an overall resultant force of zero.
38	What three deformations can happen to an elastic object when forces are applied	Stretching, Compressing and Bending
39	What is an elastic deformation?	The object will return to its original size and shape when forces are removed.
40	Give two examples of elastic objects	A spring and a sponge
41	What type of energy is stored in a stretched spring?	Elastic Potential Energy
42	How do you calculate the extension of a spring?	Length of spring with force applied – original length of spring
43	How is the extension of a spring related to the force added?	Extension is directly proportional to the force added (up to a limit)

44	What word equation links the extension of a spring, force applied and the spring constant?	Force Applied= Spring Constant x extension
45	What letter represent the spring constant in an equation?	k
46	What does the spring constant depend on?	The stiffness of the spring
47	If you increase the stiffness of a spring what happens to the size of the spring constant?	It increases
48	On the following graph what does the letter P represent? 	The limit of proportionality or the elastic limit of a spring.
49	How can you calculate the spring constant from a force-extension graph?	Calculate the gradient of the linear part of the graph
50	On a force-extension graph, what does a steeper line represent?	A stiffer spring with a larger spring constant

HSW

1	When measuring a spring with a ruler, why must the ruler be parallel?	To increase the accuracy of the reading
2	When reading a vertical scale, what is meant by a parallax error	The reading changes depending on where you are looking from
3	How do you prevent a parallax error from occurring?	Always read the measurement at eye level
4	Give two reasons to do a pilot or preliminary experiment	To find an appropriate interval size for the independent variable i.e one that gives measurable results. To check that the method works

P5- Forces – Part 2(Trilogy)

No.	Question	Answer
1	What type of quantity is distance?	Scalar
2	How is displacement different to distance?	It is a vector quantity, measuring the distance **and** direction in a straight line from the starting point
3	What is the difference between speed and velocity?	Speed is a scalar and velocity is a vector
4	What two quantities do you need to measure to calculate speed?	Distance travelled and time taken

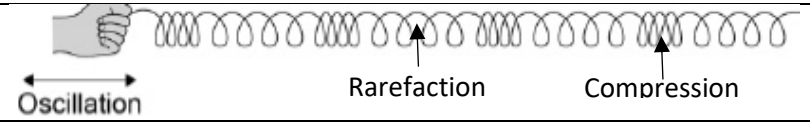
5	State the word equation used to calculate speed	Speed = distance ÷ time
6	What symbol is used to represent distance and what is the standard unit?	s, metres (m)
7	What symbol is used to represent speed (velocity) and what is the standard unit	v, m/s
8	Give the symbol equation linking distance, speed and time	s = v x t
9	Why are most speeds said to be average speeds	Objects rarely travel at a constant speed, they speed up and slow down.
10	State the typical average speed for the following three things Person walking Person running Person cycling	 1.5m/s 3.0m/s 6m/s (notice they double each time)
11	State the typical average speeds for following three things Car Train Plane	 25m/s 55m/s 250m/s
12	What is meant by acceleration?	Change in velocity in a certain amount of time
13(HT)	Why is travelling at a constant speed in a circle considered to be an example of constant acceleration?	Velocity is constantly changing due to the direction constantly changing
14	What equation is used to calculate average acceleration?	Acceleration = change in velocity/ time taken
15	What is the standard unit for acceleration?	m/s^2
16	What is meant by uniform acceleration?	constant acceleration
17	State the symbol equation for uniform acceleration? State what the symbols stand for	$v^2 - u^2 = 2as$ v= final velocity, u = initial velocity, a = acceleration, s = distance travelled
18	On a distance-tine graph what does a straight line with a gradient represent?	Constant speed
19	What does a horizontal line on a distance-time graph represent?	Stationary
20	What does a curve represent?	Acceleration or deceleration
21(HT)	How can you calculate the acceleration from a curve?	Draw a tangent to the curve and calculate the gradient
22	On a velocity-time graph what does a straight line with a gradient represent?	Constant acceleration
23	What does a horizontal line on a velocity-time graph show?	Constant speed
24	What is different about the lines on a velocity-time graph which show acceleration and deceleration	Acceleration is a line moving up the graph, deceleration is a line moving down the graph.
25(HT)	How do you use a velocity-time graph to calculate the distance travelled by an object	Work out the area under the graph.
26	Which force always acts in the opposite direction to motion?	Friction

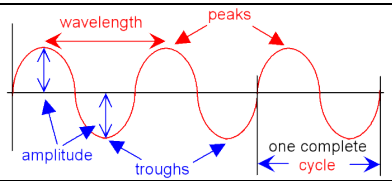
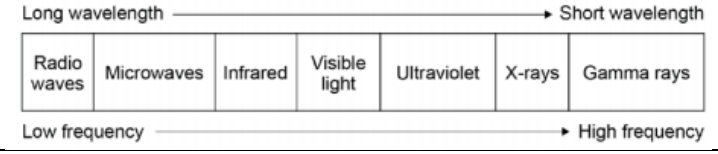
27	What other name is given to the force of friction due to objects moving through a fluid?	Drag
28	What must be true about the driving force and friction on an object moving at a constant speed?	They are the same size They are balanced The resultant force is zero.
29	When an object speeds up, what happens to the friction/drag force	Increases?
30	How can you reduce the effect of drag on a moving object?	Make it more streamlined
31	What force causes a falling object to accelerate?	Gravity
32	What force acts against gravity?	Drag/friction
33	What is meant by the terminal velocity of a falling object?	Maximum constant velocity
34	When does a falling object reach terminal velocity?	When the acceleration force due to gravity is equal to the force of friction.
35	Why do objects fall at different speeds on earth when they have the same acceleration force due to gravity?	Friction forces due to air resistance depends on the shape and surface area of the object.
36	State Newton's First Law	A resultant force is needed to make an object start moving, speed up, slow down or change direction.
37	What are the two possible conditions of an object with a resultant force of zero	It must stationary or moving at a constant velocity.
38	State Newton's Second Law	The acceleration of an object is directly proportional to the force applied
39	State the equation used to represent Newton's Second Law	F = m x a
40(HT)	What is inertia?	The tendency for the motion of an object to remain the same.
41(HT)	What is inertial mass and how is it calculated?	Measure of how difficult it is to change the velocity of an object, m= F ÷a
42	State Newton's Third Law	Equal and opposite forces act on interacting objects Or The forces acting on interacting objects are equal in size but opposite in direction
43	What is meant by the "Stopping Distance" of a car?	The total distance travelled by a car in an emergency
44	State the two components of the total stopping distance of a car	Thinking Distance and Braking Distance
45	What is the thinking distance?	The distance a car travels between seeing a hazard and the brakes being applied
46	What two key factors affect the thinking distance of a car?	The speed the car is travelling and the reaction time of the driver
47	What is the relationship between thinking distance and speed	Proportional, linear.
48	What happens to the braking distance if the speed doubles	It quadruples
49(HT)	What is momentum?	The tendency of a moving object to keep moving in the same direction
50(HT)	What two factors affect the momentum of an object?	Its mass and velocity
51(HT)	State the word equation for calculating momentum	Momentum= mass x velocity
52(HT)	State the symbol equation for momentum	p = m X v

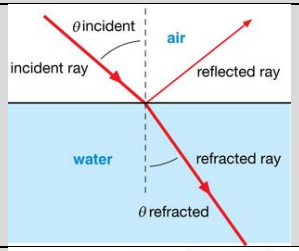
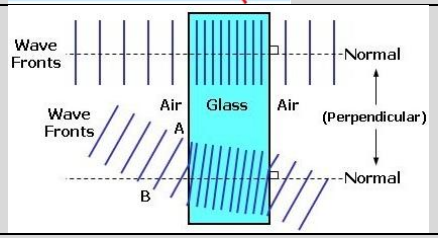
HSW

1	How do light gates work?	An object interrupts a beam of light and starts a timer, when the beam is interrupted again the timer stops. The distance between the objects is used to calculate speed.
2	How can light gates be used to calculate acceleration?	Use two light gates, a known distance apart and measure the speed of a moving object at the two different points
3	State two factors affecting the acceleration of a moving object that can be investigated using light gates.	The mass of the object, the force applied to an object.
4	Describe a simple experiment used to investigate Newton's Second Law	A trolley is attached to a piece of string that goes over pulley, Masses are adding to the end of the string to make the trolley move The trolley has a card attached which passes through two light gates
5	Describe a simple experiment used to measure reaction time.	Drop a ruler through the hand of a person and measure how far the ruler falls.
6		

Core questions – Physics unit 6 - Waves

1	What is a wave?	Transfers energy from one place to another without transferring matter
2	What are the two types of waves?	Transverse and longitudinal
3	What is an example of a transverse wave?	Ripples on the surface of water
4	What is an example of a longitudinal wave?	Sound waves travelling through air
5	What direction are the oscillations of a transverse wave compared to the direction of the energy travel?	The oscillations (vibrations) are **perpendicular** (at 90^{o}) to the direction of energy transfer
6	What direction are the oscillations of a longitudinal wave compared to the direction of the energy travel?	The oscillations (vibrations) are **parallel** to the direction of energy transfer
7	Draw a labelled diagram of a longitudinal wave?	

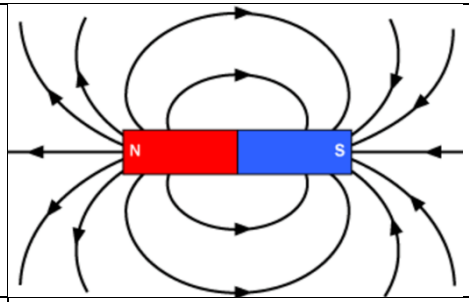
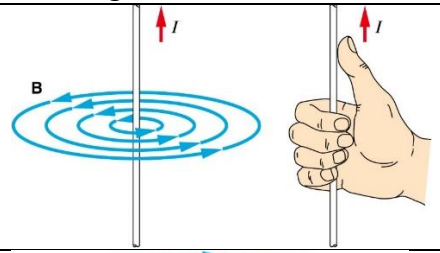
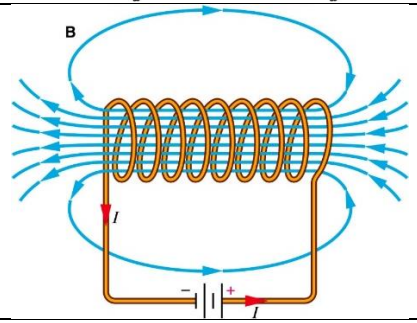
8	Draw a labelled diagram of a wave to demonstrate amplitude, wavelength, peaks, troughs and one complete cycle of a wave.	
9	What is the definition of amplitude?	The maximum displacement of a point on a wave away from its undisturbed position.
10	What is the definition of wavelength?	The wavelength of a wave is the distance from a point on one wave to the equivalent point on the adjacent wave.
11	What is the definition of frequency?	The frequency of a wave is the number of waves passing a point each second
12	What is the equation from the physics equation sheet that relates the period of one wave and frequency?	$\text{period} = \frac{1}{\text{frequency}}$
13	What is the symbol equation from the physics equation sheet that relates period and frequency?	$T = \frac{1}{f}$
14	What are the units and unit symbol of frequency?	Hertz, Hz
15	What is the wave speed?	The speed at which the energy is transferred through the medium.
16	What is the word equation for wave speed?	$\text{wave speed} = \text{frequency} \times \text{wavelength}$
17	What is the symbol equation for wave speed?	$v = f \lambda$
18	What are the unit and unit symbol of wave speed?	metres per second, m/s
19	What are electromagnetic waves?	Transverse waves that transfer energy from the source of the waves to an absorber
20	What are the groups of waves in the electromagnetic spectrum? Label increasing wavelength and frequency?	
21	What is the velocity of all electromagnetic waves through a vacuum?	300 000 000 m/s (3.0×10^8 m/s)
22	What is the only electromagnetic waves our eyes are able to detect?	Visible light
23	What is a practical application for radio waves?	Television and radio
24	What is a practical application for microwaves?	Satellite communications, cooking food
25	Why are microwaves used for satellite communications?	They are able to pass through the Earth's atmosphere
26	What is a practical application for infrared?	Electrical heaters, cooking food, infrared cameras
27	What is a practical application for visible light?	Fibre optic communications
28	What is a practical application for ultraviolet?	Energy efficient lamps, sun tanning
29	What is a practical application for x-rays and gamma rays?	Medical imgaing and treatments

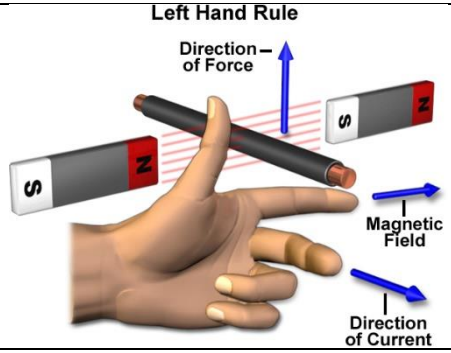
30H	What happens when a wave crosses a boundary between different materials at an angle and what is this called?	They speed up or slow down and it changes directions – called refraction
31H	Why do waves refract when they enter different substances?	They speed up of slow down
32H	What does the size of refraction depend on?	How much the wave speeds up or slows down
33H	What happens to a wave if it crosses a boundary at an angle and slows down?	It bends towards the normal
34H	What happens to a wave if it crosses a boundary at an angle and speeds up?	It bends away from the normal
35H	Draw a ray diagram to show how light is refracted at a surface between two materials.	
36H	Draw a **wave front** diagram to explain how refraction is related to the change of speed that happens when a wave travels from one medium to another.	
37H	What happens to the wavelength and frequency of a wave when it is refracted?	The wavelength changes, but the frequency stays the same
38H	How can radio waves be produced?	Oscillations in electrical circuits
39H	What is the object called in which charges oscillate to create the radio waves?	A transmitter
40H	What is the frequency of the waves produced by a transmitter the same as?	The frequency of the alternating current in the electrical circuit
41H	What happens when transmitted radio waves reach a receiver?	They are absorbed
42H	What happens to the energy that is being carried by the radio waves when it reaches a receiver?	It is transferred to the electrons in the material of the receiver and causes them to oscillate at the same frequency as the radio wave that generated it
43	How are electromagnetic waves related to atoms and nuclei?	Changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed
44	Where do gamma rays originate from?	Changes in the nucleus of an atom
45	What is radiation dose?	Radiation dose is a measure of the risk of harm resulting from an exposure of the body to the radiation.
46	What are the units of radiation dose?	Sieverts, Sv
47	How many millisieverts (mSv) make up 1 sievert (Sv)?	1000 millisieverts (mSv) = 1 sievert (Sv)
48	What effect do ultraviolet waves have on skin?	They can cause it to age prematurely and they increase the risk of skin cancer
49	Which types of EM radiation are ionising?	X-rays and gamma rays

50	What effects can ionising radiation have on the body?	They can cause mutation of genes and cancer

Core questions – Physics unit 7 – Magnetism and electromagnetism

1	What are the poles of a magnet?	The place where the magnetic forces are strongest
2	What happens when two magnets are brought close to each other?	They exert a force on each other
3	What happens when two like poles of magnets are brought close to each other?	The repel each other
4	What happens when two unlike poles of magnets are brought close to each other?	They attract each other
5	What type of force is magnetism an example of?	A non-contact force
6	What is a permanent magnet?	One which produces its own magnetic field
7	What is an induced magnet?	A material that becomes a magnet when it is placed in a magnetic field
8	What happens to an induced magnet when it is taken out of a magnetic field?	It loses most/all of its magnetism quickly
9	What is the only force that is caused by an induced magnet?	A force of attraction
10	What is a magnetic field?	The region around a magnet where a force acts on another magnet or on a magnetic material
11	What materials are magnetic?	Iron, cobalt, nickel, steel (an iron alloy)
12	What type of force exists between a magnet and a magnetic material?	Attractive magnetic force
13	What does the strength of the magnetic field depend upon?	The distance it is from the magnet. The field is strongest at the poles
14	How do we define the direction of the magnetic field?	The direction of the magnetic field at any point is given by the direction of the force that would act **on another north pole** placed at that point
15	What direction do magnetic field lines point?	From the north seeking pole of a magnet to the south seeking pole of a magnet
16	How does a magnetic compass work?	It contains a small bar magnet that points in the direction of the Earth's magnetic field
17	Why does Earth have a magnetic field?	It has an iron core
18	How can you use a compass to plot the magnetic field pattern of a magnet?	1. Place the compass in the field around the magnet 2. Draw a dot where the compass points (north and south) 3. Move the compass so that the south direction of the needle is at the dot you just drew 4. Repeat until the lines form a loop and **connect the dots**

19	Draw the magnetic field pattern of a bar magnet.	
20	What happens when a current flows through a conducting wire?	A magnetic field is produced around the wire
21	What does the strength of a magnetic field depend on when a current flows through a wire?	The size of the current The distance from the wire
22	What is a solenoid?	A coil of wire
23	What happens to the magnetic field when a wire is shaped into a solenoid?	It becomes much stronger
24	Describe the magnetic field **inside** the solenoid?	It is strong and uniform (it has the same strength and direction at every point)
25	Describe the shape of the magnetic field around a solenoid?	The same as the shape of a magnetic field around a bar magnet
26	How can the strength of a solenoid be increased?	By adding an iron core
27	What is an electromagnet?	A solenoid with an iron core
28	How can the magnetic field of a solenoid be stopped?	Turn of the current
29	What is an advantage of using an electromagnetic instead of a permanent magnet?	The magnetic field can be turned on and off
30	Draw the magnetic field pattern for a straight wire carrying a current?	
31	Draw the magnetic field pattern for a solenoid?	
32	What is the motor effect? **(higher tier only)**	The term used when a current carrying wire experiences a force, causing it to move, when placed in a magnetic field

33	Describe what happens when a current carrying wire is put between magnetic poles? **(higher tier only)**	The magnetic field around the wire interacts with the magnetic field it has been placed in, causing the wire and the magnet to exert a force on each other
34	To experience the full force from the motor effect, what direction does the wire have to be compared to the magnetic field? **(higher tier only)**	90^{o} to the magnetic field
35	When would a wire experience no force from the motor effect? **(higher tier only)**	If the wire runs **parallel** to the magnetic field
36	What does Fleming's left hand rule represent? **(higher tier only)**	The relative orientation of the directions of the force, the current in the conductor and the magnetic field
37	How can we use Fleming's left hand rule to determine the direction of the force, the direction of current and the direction of the magnetic field? **(higher tier only)**	 Thu**m**b = direction of force (**motion**) **F**irst finger = direction of magnetic **field** Se**c**ond finger = direction of **current**
38	What will affect the size of the force acting on the conductor in a magnetic field? **(higher tier only)**	The magnetic flux density, the size of the current, the length of the conductor that's in the magnetic field
39	What word equation represents the force exerted on a conductor carrying a current at 90^{o} to a magnetic field? **(higher tier only)**	Force = magnetic flux density x current x length
40	What symbol equation represents the force exerted on a conductor carrying a current at 90^{o} to a magnetic field? **(higher tier only)**	$F = B\ I\ l$
41	What is the unit and unit symbol of magnetic flux density (B) **(higher tier only)**	Tesla, T
42	What is the unit and unit symbol of current (I) **(higher tier only)**	Amps, A
43	What happens to a loop of wire carrying a current when placed in a magnetic field? **(higher tier only)**	It rotates
44	Why does a loop of wire rotate in a magnetic field? **(higher tier only)**	The current travels in opposite directions through the magnetic field meaning the forces acting on the wire act in opposite directions
45	What is used in an electric motor to switch the direction of the current in the wires causing it to continue to rotate? **(higher tier only)**	A split ring commutator
46	How do loudspeakers and headphones use the motor effect? **(higher tier only)**	They convert variations in current in electrical circuits to the pressure variations in sound waves

47	Describe how loudspeakers and headphones works? **(higher tier only)**	1. A coil of wire is attached to a cone 2. When an alternating current flows through the wire it creates a magnetic field 3. The magnetic field interacts with the field from the permanent magnet 4. This produces a resultant force on the cone causing it to move 5. When the frequency of the AC current changes, the frequency of the sound changes